RUBUS SUBGENUS EUBATUS IN NEW ENGLAND
A CONSPECTUS[1] [2]

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This paper is an attempt to define the species of blackberries in New England, to produce a workable key, and to assess the previous work on the group in our area. It is not intended to be a monographic treatment, as no attempt has been made to survey the subgenus throughout its entire geographic range. It is rather a provisional treatment for the New England area. *Rubus* is an inherently difficult genus, as the different species intergrade in a perplexing manner. More cytotaxonomic and genecological information is needed before a definitive treatment can be made. Nevertheless, 15 years of field study have convinced the authors that there are evolutionary populations that can be treated as species by competent botanists in the field, or in the herbarium, providing there is adequate data. Although we feel that our species are "good," further research, especially on hybridization and introgression, might reduce the number slightly.

The first major step in taxonomy certainly must be to establish a reasonable assemblage of taxa that are well enough defined to permit botanists to communicate facts and ideas about them. This premise appears so reasonable that it should not be necessary to mention it at this time. However, our blackberries have become essentially unworkable taxonomically largely through the reliance of authors solely on morphological criteria for the interpretation of species. As a result the circumscriptions of new taxa have been related to single specimens rather than populations. There has resulted a multiplicity of "species" a large pro-

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portion of which have no validity in evolution as such and actually are expressions of intraspecific variation or else are interspecific hybrids of many kinds. Hodgdon and Steele (1962) showed that glandularity in *Rubus alleghen-iensis* is a very variable character which makes it difficult to separate other "species" from *R. allegheniensis* on grounds of glandularity. More recently Steele and Hodgdon (1963) demonstrated that a number of so-called species could be referred to hybrids of *Rubus hispidus* and *R. setosus*. A large number of field observations and laboratory measurements support our belief that nearly all of our species of blackberry hybridize in nature. Also it is quite apparent that there is much intraspecific variability throughout most of the group involving such characters as the type of inflorescence, the quality and number of prickles and bristles, the stature and growth habit, as well as glandularity. Apomixis is a further complicating factor in the taxonomy of blackberries. In Europe Gustafsson (1946, 1947a, b) showed that *Rubus fruticosus L.*, considered as a collective species, contained both amphimictic and apomictic lesser taxa, the apomixis often being facultative. Commenting on the implications of apomixis in taxonomy Valentine & Löve (1958) wrote, "In many apomictic groups, very large numbers of species have been described taxonomically: the fact that each individual may be true-breeding means that discrimination can be much finer than in the amphimictic groups. As demonstrated by Gustafsson (l.c.), the resulting classifications vary a great deal in their usefulness and validity. Once a taxonomist dealing with a particular group has decided on his criteria he must maintain them; and in apomictic groups, this may lead to the description and naming of very many species which are very local or even ephemeral."

Einset (1951) worked with 24 "different forms of Rubus" determined by L. H. Bailey and grown at the New York State Agricultural Experiment Station at Geneva, New York. The chromosome numbers of parent plants were determined and various pollinations were tried. Einset then grew seedlings and made chromosome counts of these. He

found that from 80-100% of the progeny resulted from the parthenogenetic development of unreduced eggs. He concluded that the principal type of apomixis occurring was pseudogamy with the unreduced eggs developing parthenogenetically. He noted also that some hybrid offspring were produced, indicating facultative apomixis.

Vegetative spreading also may take place in blackberries with great rapidity. Considerable areas thus can be occupied by populations, depending on the length of time involved and barriers to spreading. With the fragmentation of such colonies a single clone may come to occupy a sufficiently extensive area in such a way as to suggest that it be recognized as a distinct "species" in the flora.

It is evident to us that the "species" that have been described, variously fit all the categories discussed above; some are "good species", some are better treated as falling within the range of variations of these "species", others are recognizable hybrids between these "good species" while still others are more obscure populations whose status is yet quite uncertain. Until the biological nature of these populations can be ascertained we are not ready to accord the lesser ones taxonomic status. The fact that many of these populations will be shown to be of hybrid origin and are thus distinct and that they tend to produce essentially similar offspring by apomixis or vegetative spreading, does not mean to us that they should be regarded as species. However distinct the hybrid population may have been when it first appeared, we don't consider it to be a species unless it has undergone subsequently a recognizable amount of evolutionary change. Such change is expressed in the development of evident and distinct morphological characteristics and those adaptive traits which permit the population to occupy a definite geographic range.

Our work on *Rubus* started with an attempt to compile a list of species for New Hampshire. At one time there was much interest in creating hybrids of horticultural value in *Rubus* at the University of New Hampshire under the direction of the late Dr. Albert F. Yeager. Several phases of research were completed which are of interest to taxono-

mists. One by Dr. Donald Craig (1959) related to our present study. It demonstrated that *R. canadensis*, a triploid, could be crossed with various blackberry cultivars.

At the beginning of our study we used the eighth edition of Gray's Manual expecting confidently to locate each species that Fernald attributed to New Hampshire. This soon led us to try out Bailey's elaborately presented studies in Gentes Herbarum (1932-49). Both treatments helped us make a start beyond which they became frustrating and, particularly true of Bailey, essentially unworkable. Because of the great prestige and massive productivity of both Fernald and Bailey we were too willing to accept their "species" without reservation but very soon we perceived that by relying solely on morphological criteria for "setting up" new species the end was by no means in sight, for if we wanted to add to the plethora of species, we too could proceed on the same basis and describe still more.

Our field studies and collecting have taken us throughout most of New England and also led us into parts of New Brunswick, Nova Scotia, and New York. The most significant omissions have been upper Maine, where there is reason to believe the number of species is relatively small, western Vermont and western Massachusetts. We have studied in the field and made collections of all indigenous species that we are recognizing in this treatment except *Rubus cuneifolius*. We have taken pains to make sure that all our collections of blackberries have careful descriptive notes on the growth-habit and include both primocanes and floricanes. To provide evidence of our research we have accumulated large collections of *Rubus* at the University of New Hampshire (NHA) and in Tamworth, N. H. (private herbarium of Steele).

Necessarily a considerable part of our work has been devoted to the study of herbarium specimens and particularly in recent years, to a careful evaluation of nomenclatural types. We wish to express our appreciation to the curators and staffs of the following herbaria which we have consulted, the Gray, Arnold Arboretum, and New England

Botanical Club herbaria at Harvard University, the Pringle Herbarium of the University of Vermont, the Jesup Herbarium of Dartmouth College, and the Bailey Hortorium collection of Cornell University. Bailey and Fernald set a high standard of collecting which often has been maintained by those who have come after them, but a very large proportion of the specimens in most herbaria are not subject to critical determination, since they are usually without habit notes and very often consist only of primocanes or floricanes, not both. Thus the value of these large collections in elucidating the taxonomic problems in the group is somewhat less than one might expect. Our principal approach has been the study of populations in nature and the collecting of much appropriate material followed by intensive herbarium study consisting of rather exact measurements of parts, the tabulation of results and the subsequent analysis of the population. One test of the validity of scientific work is predictability. Now with our background of experience in observing populations and analyzing them, when we enter a characteristic type of environment and find certain kinds of blackberries present, we can often anticipate finding the putative parents or hybrid offspring in the same general area.

Taxonomic work on *Rubus* subgenus Eubatus in New England in this century has been carried on by an interesting group of botanists. William Henry Blanchard (1850-1922) a farmer and country schoolmaster of southern Vermont described many species, amongst which we are recognizing the following in this paper: *R. recurvicaulis*, *R. arenicola*, *R. semisetosus*, *R. vermontanus* and *R. elegantulus*. Fernald (1950) accepted 19 additional Blanchard species. Several of these we interpret as rather commonly occurring hybrids having distinctive morphological features by which they can be recognized, *R. jacens* and *R. tardatus* for example.

Blanchard had a keen collector's eye but most of his specimens lack habit-notes. Also his method of collecting involved the grouping of several separate collections under

one collection number. This applies to types as well as to other specimens and make his specimens confusing to study. Bailey has selected lectotypes from Blanchard's "types" for most of the critical material.

Ezra Brainerd (1844-1924), also from Vermont, was at one time the President of Middlebury College and he had established a botanical reputation for his work on the genus *Viola*. His interest in blackberries largely was related to their breeding behavior and in fact his chief contribution was his recognition of the importance of hybridization in the group. With A. K. Peiterson (1920) he published a very interesting and suggestive paper on the subject. Essentially they recognized 12 basic species in New England which were postulated to have crossed and given rise to all the myriad of forms to be found in the area. Our chief criticism of their work centers around the inadequate evidence that was advanced to support their conclusions. A large part of the statements made about the parentage of their hybrids seem to be hypothetical and not proven. Also the taxonomic basis for the paper was faulty; for example they recognized *R. Baileyanus* Britt. which we have been unable to confirm and they failed to distinguish *R. recurvicaulis* Blanch. *(R. plicatifolius)* which we find to be fully distinct as a species.

A. K. Peiterson (1921) published a study of variation and hybridization in the blackberries. He performed transplant experiments to study the effect of environment on growth habit and armature. The indication was that plants grown in full shade were more erect than those in sun, the latter showing a marked tendency to trail. Primordial prickles and hairs were present on all blackberries. Their development is controlled by both genetic and environmental factors. In one experiment, suckers from the root of a plant grown in full sunlight produced many more prickles and glandular hairs than suckers from the same plant grown in shade. Infertility of blackberries, due to defective pollen, was found to be common. The two extremes, *R. alleghenien-sis* and *R. Baileyanus*, showed less infertility than any others possibly indicating that they were primitive species.

Many others may have been of hybrid origin. Eleven species were used in hybridization experiments and all crosses attempted were successful even though some species were remotely related. As a result of these experiments, Peiterson concluded, and the authors of this article concur, that hybridization is common in the Eubati and that a large number of so-called species are hybrids.

Although Peiterson's work was significant, he did not preserve voucher specimens of his crosses and it is difficult to know what the actual results were in terms of the species as we interpret them. Observations of herbarium material in the Pringle Herbarium at the University of Vermont indicate that several of Peiterson's species represent a varied assemblage of plants. For example any low blackberry of the Flagellares section may be designated as *R. Baileyanus* and any of three species may be designated as *R. frondosus*. It would be highly desirable to repeat the experiments preserving voucher specimens at all stages. Nonetheless had Bailey and Fernald accepted Brainerd's and Peitersen's explanation for the great diversity of blackberries as attributable to crossing, the study of *Rubus* subgenus Eubatus would probably have been brought into some order before now.

In Gray's Manual (1950) are to be found two species of Brainerd's, *R. severus* and *R. sceleratus* both of which are highly localized aberrant populations presumably of hybrid origin which we are not recognizing as species.

The name of Eugene P. Bicknell (1859-1925) must be introduced in relation to Blanchard and Brainerd. Bicknell (1910) published an article entitled "Have we enough New England Blackberries." He recognized 11 species including *Rubus flagellaris* Willd. which up to that time had not been interpreted properly. He accepted none of Blanchard's outpouring of species. Of the then recently published species of Blanchard and a few other newly named species proposed by other authors he made the following comment, "It would scarcely yet be the part of wisdom to accept any one of these new names as denoting a valid species nor, on the

other hand, is there sufficient warrant in our present knowledge for separating all of them as being without standing. I should suppose however, that some sixty per cent of the number might be allowed to pass into the category of synonyms; the remainder, possibly with a few exceptions, appear to disclose themselves as scarcely doubtful hybrids". It is ironic that Bailey (1941) named a species for Bicknell — a very localized blackberry of Nantucket which most certainly is of hybrid origin. Bailey concluded his remarks following the description of *R. Bicknellii* with the statement ". . . . ; his publication had much influence on the Rubus work of Rydberg and Brainerd". Yet Bicknell in the afore-mentioned discussion of New England blackberries had acknowledged Brainerd's influence in interpreting the great diversity of blackberries in York County, Maine as the result of hybridization.

Thus there were in the early years of this century two schools of thought concerning *Rubus* which have continued to the present.

Per Axel Rydberg (1913) tended to follow the conservative approach of Bicknell and Brainerd. However, for New England, he recognized 25 species, 12 of which we still maintain. He was more discerning than Bicknell in evaluating Blanchard's species: we find him accepting *Rubus vermontanus*, *R. arenicola* and *R. elegantulus*. He recognized *R. plicatifolius* of Blanchard which was published at the same time as was *R. recurvicaulis*, also Blanchard's *pergratus* which now is considered to be synonymous with Poiret's *pensilvanicus* and finally Blanchard's *recurvans* which we consider a state of *frondosus*. He followed the practice of Bicknell in listing the possible hybrids for each species. The difficulty with this approach to the problem of hybridization lies in its speculative quality; no evidence was provided and no specimens cited.

Liberty Hyde Bailey (1858-1954) did a prodigious amount of work on Rubus. He improved the terminology, devising such terms as primocane, floricane, parcifrond and novirame. He brought order and method to the study of the

group and he established an herbarium of the finest quality at Cornell University. Bailey proposed five of the seven native Sections of *Rubus* subgenus Eubatus that are often recognized in New England. These are Flagellares, Setosi, Cuneifolii, Canadenses and Allegheniense. He provided a scholarly basis for further taxonomic work by clarifying types and designating them where necessary. His major treatments in Gentes Herbarum are clearly prepared and carefully illustrated. Because of the orderliness and completeness of his work it is easy to see his shortcomings. As pointed out by Steele & Hodgdon (1963) pp. 262, 263, Bailey refused to recognize hybridization as a taxonomic problem in blackberries. Also he paid scant attention to the variability within the species. Since there are no evident limits to variability in the group L. H. Bailey described hundreds of new species. Some of the folders at the Bailey Hortorium bear evidence that Dr. Bailey became confused at times; too often the other specimens in the folder fail to resemble the types. Bailey never accepted Blanchard's *Rubus elegantulus* although this is without doubt one of the most abundant and distinctive species throughout central and northern New England and eastern Canada. The only one of Bailey's species that we accept is *Rubus Jaysmithii* which is readily separable from its closest relative *R. flagellaris* by its pubescent leaves. Unless other distinctions can be found it may be better eventually to treat *R. Jaysmithii* as a lesser taxon.

M. L. Fernald (1873-1950) also made substantial contributions to our knowledge of *Rubus*. Although in a footnote (p. 822 in Gray's Manual 8th Ed. 1950) he recognized that hybridization was rife and accounted for many of the morphologically distinctive trends, in only one case *(R. abbrevians)* did he designate a species as a probable hybrid. This is in marked contrast to his treatment of *Salix*, for example, where he described a number of hybrids, and indicated specifically a great many crosses. Fernald established the Section Tholiformes and described many new species in it, several of which were confined to central and northern New Hampshire, others more widely dispersed in

the Northeast and with some local species elsewhere. Fernald also described new species in several of the other Sections. He was somewhat more discriminating than Bailey in the sense that his "species" were more likely to be well defined morphologically. In an earlier paper on hybrids (1963) we indicated that we considered some of Fernald's species to be hybrids of *Rubus hispidus* and *R. setosus*. We were able to locate *R. aculiferus* Fern. which belongs in this category of hybrids at North Woodstock, New Hampshire. On Cape Cod we succeeded in finding *Rubus paludivagus* Fern. which we consider to belong to *R. argutus*. In Fernald's treatment (1950) the New England species fall into eight sections. The Tholiformes seems to be a collection of hybrids and aberrant forms without any common unifying factor. The other sections represent reasonably natural divisions with some overlapping at times but, because in New England several would contain only one or two species, there has seemed little point in our recognizing them. We see no merit in regarding the sections as superspecies, which seems to be an artificial concept of doubtful convenience.

Fernald's major contribution in *Rubus* seems to have been his often sensible evaluation of the work of others such as Blanchard, Brainerd, and Bailey. He seemed to know blackberries in New England better than Bailey did. He was fully aware of the distinctiveness of Blanchard's *R. elegantulus* for example. Fernald screened out a vast array of Bailey's minor "species" though it must be admitted that he might better have omitted many others along with a number of his own making.

Through experience we have found that Fernald's treatment in Gray's Manual with all its prolixity, provides the best starting place for taxonomic work on the group in New England.

The recent handling of our blackberries by Gleason and Cronquist (1963) reflects the commendable decision of the authors to reduce the group to workable size. However the treatment, so far as New England, is concerned, is not satisfactory. The following species are omitted, *Rubus elegan-*

tulus, *R. vermontanus* and *R. semisetosus* while *R. Enslenii* is stated to extend north only to Pennsylvania. Two other species which we do not recognize are given for New England, *Rubus orarius* and *R. ostryifolius*.

Longley (1924) and Einset (1945) have reported chromosome numbers of many species of *Rubus*. Many of Longley's determinations must remain in considerable doubt since there is much question as to the identity of his species and the chromosome numbers are often at variance with the better documented work of Einset whose plants were identified by L. H. Bailey. It seems clear from Einset's findings that *Rubus allegheniensis* and *R. setosus (R. Boottianus)* have 2N=14 chromosomes, that *R. canadensis* is a triploid with 3N=21 while both *R. flagellaris* and *R. recurvicaulis* have 63 chromosomes. Other species reported by Einset were all polypoids, some of them with variation in chromosome number. Plants of *R. bellobatus* for example, reported to have been collected from two different localities near Ithaca, had chromosome numbers of 21 and 28. Einset reported *Rubus abactus* with 35 chromosomes and *R. avipes* to have 21. Both in our opinion belong in the species *R. pensilvanicus*.

We have been able to identify most mature Rubi that we encounter in the field by means of the present treatment, (providing the primocanes and floricanes are both present) except for young plants that have been excessively stunted by mowing. Many plants encountered would be classified as hybrids in which case it is nearly always possible to specify one or both putative parents. It is hoped in a future article to describe the more common hybrids so that they can be recognized.

It is not possible to identify all herbarium specimens. Early collectors, notably Blanchard and Brainerd, did not include growth-habit notes on the label. Thus a guess as to growth-habit, from the appearance of the plant on the sheet, must be made. At best this is an unsatisfactory procedure and usually is quite impossible. Many collections contain either primocanes or floricanes but not both. Little can be

done with these. The most characteristic part of the primocane in the middle part of the cane with two or three attached leaves. When only the tip is collected, identification is less certain, and in the case of sheets consisting of mere fragments it is impossible.

The characteristics used in the description of *Rubus* require special terms. Growth-habit is the most important single characteristic for major division of species. The primary distinction is between upright and trailing plants. It should be noted, however, that normally erect plants will sometimes become bent over at the edge of a colony and may reach the ground. Species that are normally trailing may arise to a considerable distance off the ground if supported on vegetation. Young primocanes are often erect and do not attain their trailing habit until late in the season. The terms used by us to describe growth habit are *erect*, *arching*, *doming*, *trailing*, and *prostrate*. *Erect* plants are nearly vertical. *Doming* plants are 1′ to 3′ high and curve so that their tips reach the ground. *Prostrate* plants are in contact with the ground for their full length, whereas *trailing* ones start off as low-domers. The term *reclining* is used for floricanes that are close to the ground, apparently having been lodged by snow.

The nature of the prickles is distinctive. At one extreme are the *stout* broad-based prickles usually 5 mm or more long. At the other extreme are *acicular* prickles with slightly dilated bases, but needle-shaped. *Thin* prickles are intermediate between the two. *Bristles* are no thinner than acicular prickles but are soft to the touch. Prickles if directed backwards are *hooked* if curved, *retrorse* if straight.

In the treatment to follow two introduced species are included in the key but otherwise the study is confined to native Rubi. It must be recognized that cultivars may escape to the wild and persist. At present introduced blackberries do not constitute a major taxonomic problem in New England.

Key to Rubus Subgenus Eubatus in New England

Note, hybrids can not be identified with the key although it may provide a clue to their origin.

Inflorescence mostly a raceme or resembling a cyme or corymb, if paniculate, lacking abundant prickles on pedicels; indigenous species.

Mature primocane doming, trailing or prostrate.

Primocane low-doming, long-trailing or prostrate.

Primocane bristly without strong prickles; leaflets usually 3, coriaceous and lustrous. ..... 6. *R. hispidus*

Primocane with few to many strong and hooked or straight and short prickles, rarely setose; leaflets 3 or 5, not coriaceous.

Cane very slender, 1-2 mm in diameter; inflorescence 1-2-flowered; plant of oak-or oak-hickory-woods. .. 3. *R. Enslenii*

Cane slender to medium, 1.5-4 mm in diameter; well-developed inflorescences 1-12 flowered.

Pedicels erect, up to 6 (averaging 4) cm long; inflorescences 1-3 (5)-flowered.

Leaves glabrous or subglabrous beneath ..... 1. *R. flagellaris*

Leaves pubescent beneath ..... 2. *R. Jaysmithii*

Some pedicels ascending or divergent, central ones short (.5 cm); inflorescences 1-12 flowered.

Leaves glabrous or nearly so beneath ..... 4. *R. recurvicaulis*

Leaves soft-pubescent or velvety beneath ..... 5. *R. arenicola*

Primocanes low-or high-doming, tips often reaching ground.

Canes slender, 1-4 mm in diameter, armed with thin prickles or bristles.

Canes armed with hooked or thin and retrorse sharp prickles ..... 4. *R. recurvicaulis* or 5. *R. arenicola*

Canes armed with bristles or straight acicular prickles 100-200 per decimeter ..... 7. *R. setosus* or prickly forms of 8. *R. vermontanus* 9. *R. semisetosus* and 12. *R. elegantulus*

Canes stout 3-9 mm in diameter, armed with strong straight prickles .. 15. *R. frondosus* or extremes of 13. *R. alleghensis*

Mature primocanes arching or erect.

Well developed plants low, 0.3-1 m high, armed with bristles, acicular prickles or hooked prickles; leaves medium-sized averaging 8-18 cm broad.

Leaves glabrous beneath.

Armature of numerous soft bristles ..... 7. *R. setosus*

Armature of acicular prickles resistant to touch.

Central petiolule 1.4-2 cm long. ..... 8. *R. vermontanus*

Central petiolule 2.5-4 cm long. ..... 12. *R. elegantulus*

Leaves pubescent beneath.

Leaves pilose to velvety beneath, armature of acicular prickles. ..... 9. *R. semisetosus*

Leaves densely tomentose beneath, armature of strong, stout hooked prickles, ... 10. *R. cuneifolius*

Well-developed plants 1-2 m high; leaves large, averaging 12-24 cm broad.

Leaves glabrous beneath.

Armature of 0-10 thin prickles per decimeter. ..... 11. *R. canadensis*

Armature of 10-100 prickles per decimeter. ..... 12. *R. elegantulus*

Leaves pubescent or velvety beneath.

Axis of inflorescence pubescent and with numerous stipitate glands. ..... 13. *R. allegheniensis*

Axis of inflorescence pubescent, glandless or rarely with glands.

Leaflets lanceolate, ratio of width to length 0.5 or less, base rounded to cuneate. ..... 14. *R. argutus*

Leaflets ovate, ratio greater than 0.5, base cordate to rounded.

Leaves chartaceous or subchartaceous; prickles thin to stout, 4-6 mm long, often numerous, 4-60 per dm. ..... 15. *R. frondosus*

Leaves subchartaceous to membranaceous; prickles thin to medium, 2-4 mm long, usually few 0-20 per dm. ..... 16. *R. pensilvanicus*

Inflorescence a large terminal panicle, its branches and pedicels with abundant prickles; introduced species of southern New England.

Leaflets deeply cut, green beneath. ..... *R. laciniatus*

Leaflets merely toothed, white-velutinous beneath. ..... *R. bifrons*

1. *Rubus flagellaris* Willd. PRIMOCANE trailing to prostrate (sometimes climbing over low vegetation), commonly tip-rooting; FLORICANE trailing to prostrate; ARMATURE of hooked prickles 1-3(4) mm long, 5-50 per dm, occasionally more; DIAMETER OF CANES 1.5-3 mm; PRIMOCANE LEAFLETS mostly 3, sometimes partly divided or 5 in number, mostly chartaceous, ovate or rhombic to suborbicular, the ratio of width to length 0.6-0.8, abruptly acuminate to apex, rounded to base, glabrous above, glabrous or very lightly pubescent on veins beneath; DIMENSIONS OF COMPOUND LEAF 6×6-13×13 cm; INFLORESCENCE a *narrow slender raceme* 6-11 cm long with 1-4 (5) flowers on *nearly erect long pedicels*, lowest and longest pedicels 3-4 (5) cm long, the uppermost 1-2 cm; axis of inflorescence and pedicels usually somewhat pubescent and often prickly, not bearing any glands; early flowering; FRUIT globular or subglobular, ripening early, often of good quality; HABITAT, fields, sandy areas, roadsides and ledges; RANGE, central Maine south and west, common at low elevations.

Five species in this treatment: *R. flagellaris*, *R. Jaysmithii*, *R. Enslenii*, *R. recurvicaulis* and *R. arenicola* belong to the section Flagellares of Gray's Manual. Of these five, the first three appear to be closely related, intergrade frequently, and could, with some justification be considered to form one superspecies. When they are stunted because of mowing, or from an unfavorable site, or when they are not fruiting well, they are difficult to separate. However, when well developed with good floricanes, they can usually be readily identified in the field. The basic division is between the flagellaris group and the recurvicaulis group. Further study may indicate that *R. Jaysmithii* and *R. arenicola* would better be considered as varieties of *R. flagellaris* and *R. recurvicaulis* respectively. They are not well represented in herbaria, but are often encountered in the field, where they can usually be recognized. It may be assumed that all of these species hybridize with each other on occasion, but it would be difficult to establish with certainty the nature of the hybrids.

In identifying members of the group, it should be noted that new primocanes start as arching shoots and do not develop trailing tendencies until the middle of the season. In favorable sites, such as new roadside soil where there is no competition, the primocanes are so vigorous that they develop mounding tendencies, thus falling in the category of the section Tholiformes so far as habit is concerned. On bare gravel or ledge, the primocanes may become excessively long trailing. This seems to be a direct response to environment and is of no diagnostic significance. By mid-August it is common to find vigorous primocane colonies in open areas with masses of canes and few or no fruits. These cannot be identified as to species.

All of these species have small sharp prickles, usually hooked, and are unpleasant to touch. They usually can be recognized as belonging to the flagellares group by this character alone. Under favorable conditions they have fruit of good quality, large and sweet. Because of the prostrate habit and numerous prickles, the fruit is not as easily har-

vested as that of the erect species, but it is often of better quality.

As indicated in the key, *Rubus flagellaris* is distinguished from *R. recurvicaulis* primarily by the inflorescence. In addition it can be noted that *R. flagellaris* tends to be lower than *R. recurvicaulis* and trailing or prostrate, while the latter may be high trailing or doming. *Rubus flagellaris* may trail off the ground on vegetation but will not, under these conditions, get as high above the ground as *R. recurvicaulis*. There also may be a difference in leaves with those of *flagellaris* being smaller and duller.

As indicated above, hybridization is undoubtedly frequent within the flagellares group. These are indications that *Rubus flagellaris* hybridizes with several species in other sections but these hybrids are uncommon.

REPRESENTATIVE SPECIMENS: MAINE: SOMERSET CO., Fairfield, *Fernald & Long 13901* (NEBC); ANDROSCOGGIN CO., Auburn, July 21, 1924, *Bean* (NEBC); CUMBERLAND CO., Standish, *Fernald & Long 13908* (NEBC); YORK CO., Arundel, August 3, 1905, *Blanchard* (NEBC, as *R. geophilus* Blanchard); Alfred, *Fernald & Long 13897* (NEBC). NEW HAMPSHIRE: COÖS CO., Whitefield, *Pease 37861* (NEBC); CARROLL CO., Bartlett, *Steele 3496* (STEELE); Tamworth, *Steele, 2780* (STEELE); STRAFFORD CO., Milton, *Hodgdon & Steele 10908* (NHA); Durham, *Hodgdon 5159* (NHA); BELKNAP CO., Alton, *Hodgdon & Steele 12257* (NHA); MERRIMACK CO., Hooksett, *Hodgdon 10912* (NHA); SULLIVAN CO., Charlestown, *Hodgdon & Steele 11365* (NHA); ROCKINGHAM CO., Seabrook, *Hodgdon & Steele 10911* (NHA). VERMONT: WINDSOR CO., Hartland, *Wheeler 26770* (NEBC); RUTLAND CO., north of Rutland, July 1, 1914, *Brainerd 11* (NEBC); WINDSOR CO., Newfane, *Wheeler 27000* (NEBC). MASSACHUSETTS: ESSEX CO., Salisbury, *Steele & Hodgdon 3501* (STEELE); PLYMOUTH CO., Plymouth, *Fernald & Hunnewell 15232* (NEBC); BRISTOL CO., Dartmouth, August 12, 1910, *Hervey* (NEBC); BARNSTABLE CO., Barnstable, *Fernald 18589* (NEBC); NANTUCKET CO., Nantucket Island, *Bicknell 11907* (NEBC); WORCESTER CO., June 26, 1921, *Weatherby* (NEBC); BERKSHIRE CO., Sheffield, May 30, 1919, *Bean & Fernald* (NEBC); CONNECTICUT: TOLLAND CO., Stafford Springs, *Steele & Hodgdon 3893* (STEELE); HARTFORD CO., Southington, *Andrews 5051* (NEBC); NEW LONDON CO., Stonington, *Hodgdon & Steele 14828* (NHA); NEW HAVEN CO., Oxford, Harger *729* (NEBC).

2. *Rubus Jaysmithii* Bailey. Differs from *R. flagellaris* in having leaflets soft-pubescent or velvety beneath to the touch; in similar

habitats and probably of about the same range as *R. flagellaris*, but less common.

This species is closely related to *R. flagellaris*.

REPRESENTATIVE SPECIMENS: NEW HAMPSHIRE: CARROLL CO., Sandwich, *Hodgdon & Steele 14829* (NHA); GRAFTON CO., Plymouth, *Fernald, 11174* (NEBC); Rummey, *Steele 2869* (STEELE); STRAFFORD CO., Rochester, *Hodgdon 10915* (NHA); MERRIMACK CO., Franklin, *Hodgdon 7270* (NHA); ROCKINGHAM CO., Nottingham, *Hodgdon 14830* (NHA); Salem, *Steele 2281* (STEELE). VERMONT: RUTLAND CO., Rutland, September 15, 1912, *Kirk* (NEBC); WINDHAM CO., West Wardsboro, July 25, 1913, *Brainerd 10* (NEBC); Westminister, *Steele 3498* (STEELE). MASSACHUSETTS: ESSEX CO., Danvers, *Steele 768* (STEELE); NORFOLK CO., Walpole, *Hodgdon & Steele 18431* (NHA); BARNSTABLE CO., Harwich, *Fernald 16930* (NEBC); Chatham, *Fernald 16932* (NEBC); DUKES CO., Marthas Vineyard, July 1, 1913, *Bicknell* (NEBC); NANTUCKET CO., Nantucket Island, *Bicknell 11894* (NEBC); FRANKLIN CO., East Charlmont, July 4, 1921, *Churchill* (NEBC). RHODE ISLAND: NEWPORT CO., Block Island, *Jansson 19* (NEBC); PROVIDENCE CO., East Providence, *Wiegand 1009* (NEBC).

3. *Rubus Enslenii* Tratt. PRIMOCANE mostly trailing, sometimes low-arching (0.3 mm); FLORICANE of similar habit; ARMATURE of thin sharp and hooked prickles, 1-2 mm long, 2-60 per dm; DIAMETER of cane 0.5-2 (2.5) mm; PRIMOCANE LEAFLETS mostly 3, sometimes 5 in number, membranaceous to subchartaceous, ovate, the ratio of width to length 0.6-0.7, subacute to acuminate at apex, rounded to subcuneate at base, glabrous above, essentially glabrous beneath (sometimes finely pubescent on veins); DIMENSIONS OF COMPOUND LEAF 7×7-12×12 cm, AVERAGING SMALLER than *R. flagellaris*; INFLORESCENCE a narrow raceme 2-6 (8) cm long, with *1-2 (3) flowers on nearly erect pedicels*, solitary or longest pedicels 2-6 (8) cm long; axis of inflorescence and pedicels mostly pubescent and with or without prickles, lacking glands; early flowering; FRUIT sparse, often of good quality; HABITAT, dryish woods mostly of oak-hickory and on ledges; RANGE, southern Maine mostly near coast, central and southern New Hampshire southward and westward, less common to the north.

Although this blackberry is at times close to reduced forms of *R. flagellaris* it is the most distinctive of the Flagellares and clearly a good species. In addition to morphological differences it has a distinct range and characteristic environment. Its range in New England is somewhat restricted. It reaches its northern limits in central N. H. and southern Maine. The most characteristic habitat of *Rubus Enslenii* is open oak-hickory woods, but it is also found in

mixed woods and small rocky openings. A small trailing prickly blackberry in hickory-woods is certainly this species.

It is one- or two-flowered with thin stems and small dull glabrous leaves, usually three in number. In shady sites the floricanes may not produce any flowers at all. *Rubus flagellaris* is often one- or two-flowered and may have slender canes, but usually inflorescences can be found with more flowers while the leaves average larger and are often 5 foliate.

REPRESENTATIVE SPECIMENS: MAINE: CUMBERLAND CO., Brunswick, June 28, 1913, *Furbish* (NEBC); YORK COUNTY, Biddeford, *Hodgdon & Steele 14832* (NHA); York, *Hodgdon & Steele 14833* (NHA). NEW HAMPSHIRE: CARROLL CO., Tuftonboro, *Hodgdon & Steele 12243* (NHA); STRAFFORD CO., Durham, *Hodgdon 3032* (NEBC); Durham, *Hodgdon & Steele 14834* (NHA); MERRIMACK CO., Boscawen, *Pease 19150* (NEBC); ROCKINGHAM CO., Nottingham, *Hodgdon & Steele 10916* (NHA); Seabrook, *Hodgdon & Steele 10917* (NHA). MASSACHUSETTS: MIDDLESEX CO., Pepperel, *Steele 2777* (STEELE); Concord, June 1, 1960, *Eaton* (NEBC); Lincoln, June 30, 1956, *Eaton* (NEBC); SUFFOLK CO., Arnold Arboretum, *E. J. Palmer 44596* (NEBC); BARNSTABLE CO., Harwich, *Fernald & Long 16934* (NEBC); NANTUCKET CO., Nantucket Island. *Bicknell 12044* (NEBC); WORCESTER CO., Leominster, *Fernald & Bean 14058* (NEBC). RHODE ISLAND: WASHINGTON CO., Charlestown, *Fernald & Phelps 16936* (NEBC). CONNECTICUT: WINDHAM CO., Putnam, June 11, 1922, *Bill & Grigg* (NEBC); NEW LONDON CO., Franklin, May 25, 1906, *Woodward* (NEBC); Stonington, *Steele & Hodgdon 3890* (STEELE).

4. *Rubus recurvicaulis* Blanch. PRIMOCANE trailing to low doming or low arching to 0.3-0.6 m high, in dense vegetation often appearing suberect early in growth; FLORICANE trailing or reclining to low arching; ARMATURE of stiff hooked or straight retrorse prickles 2-4 mm long, (2-) 10-50 (-100) in number per dm; DIAMETER OF PRIMOCANE 2-4 mm; PRIMOCANE LEAFLETS 3-5 in number, chartaceous, ovate (rhombic), ratio of width to length 0.6-0.8, acuminate at apex, rounded to subcordate at base, glabrous above and glabrous beneath or with slight pubescence on veins beneath; DIMENSIONS OF COMPOUND LEAF 8×8-14×14 cm; INFLORESCENCE a compact to diffuse raceme (corymb of many authors) with *2-8 (1-12) flowers*, 3-9 (2-10) cm long, 2-5 (1-6.5) cm wide, *pedicels spreading to ascending, the longest 1.5-4, the upper 0.5-1 cm long; axis of inflorescence and pedicels* mostly with slight to medium pubescence, prickles often present, glands *absent;* early flowering; FRUIT, poor quality to good; HABITAT, pastures, fields, railroad banks and roadsides; range throughout New England, at low elevations.

This species occupies the same habitats as *Rubus flagellaris* and often resembles it. When properly developed, the inflorescences are distinctive with some flowers on short pedicels, some of which are ascending or diverging as opposed to the erect pedicels of *R. flagellaris*. At times, especially in poor soils, the primocanes do not assume the trailing habit but remain low-arching, not close to the ground. At other times, when there is little competition, the primocanes may form large tangled doming and trailing colonies with few well-developed inflorescences. The colonies may be difficult to classify, but growth-habit alone will suggest an affinity to *R. recurvicaulis* rather than *R. flagellaris*.

The fresh leaves of this species vary from dull to lustrous and the margins may be plicate when the leaves are young. This tendency has led to the "Manual" species *R. plicatifolius* not here recognized.

Most blackberries grow in disturbed locations and thus the stations tend to be temporary. An apparently natural location for the flagellares-group is pockets of soil on ledges and cliffs. Most New England cliffs will contain one of these species presumably growing in natural and virgin sites, as such habitats have been little disturbed by agriculture and lumbering.

REPRESENTATIVE SPECIMENS: MAINE: AROOSTOOK CO., Fort Kent, July 6, 1906, *Fernald* (GH); Ashland, August 8, 1901, *Fernald* (NEBC); PENOBSCOT CO., Oldtown, *Fernald & Long 13883* (NEBC); PISCATAQUIS CO., Abbot, *Fernald & Long 13875* (NEBC); OXFORD CO., Rumford, *Fernald & Pease 2516* (NEBC); WASHINGTON CO., Roque Bluff, July 25, 1913, *Knowlton* (NEBC); KNOX CO., Matinicus, July 19, 1920, *C. A. E. Long* (NEBC); LINCOLN CO., Monhegan Island, *Hodgdon & Hodgdon 12941* (NHA); Southport Island, *Hodgdon 7228* (NHA); KENNEBEC CO., Vassalboro, *Fernald 13904* (NEBC); CUMBERLAND CO., Harpswell, *Hodgdon & Steele 12169* (NHA); YORK CO., Alfred, *Fernald & Long 13898* (NEBC); Kittery, *Hodgdon & Steele 12171* (NHA). NEW HAMPSHIRE: COÖS CO., Shelburne, *Pease 11162* (NEBC); CARROLL CO., North Conway, *Hodgdon & Steele 12189* (NHA); Sandwich, *Hodgdon & Steele 14835* (NHA); GRAFTON CO., Lincoln, *Fernald 15796* (NEBC); Campton, *Hodgdon & Steele 11354* (NHA); STRAFFORD CO., Durham, *Hodgdon 12261* (NHA); Milton, *Hodgdon & Steele 10920* (NHA); ROCKINGHAM CO., Northwood, *Hodgdon & Steele 10930* (NHA); Seabrook, *Hodgdon & Steele 10928* (NHA); HILLSBORO CO., Litchfield, *Steele & Hodgdon 3842* (STEELE).

VERMONT: WINDHAM CO., Westminster, *Steele 3479* (STEELE); BENNINGTON CO., Searsburg,, June 20, 1925, *Carpenter, Churchill & Knowlton* (NEBC). MASSACHUSETTS: MIDDLESEX CO., Concord, June 19, 1958, *Eaton* (NEBC); BARNSTABLE CO., Barnstable, *Woodward & Fernald 1523* (NEBC); WORCESTER CO., Royalston, *Steele & Hodgdon 3819* (STEELE); HAMPSHIRE CO., Middlefield, *Fernald & Long 9678* (NEBC); HAMPTON CO., Springfield, June 17, 1914, *Andrews* (NEBC). Specimens from Rhode Island and Connecticut in the herbarium of the New England Botanical Club are hardly adequate for purposes of citation.

5. *Rubus arenicola* Blanch. Differs from *R. recurvicaulis* chiefly in having *leaves abundantly pilose to soft-velvety beneath* and *axis of inflorescence and pedicels with medium to strong pubescence;* HABITAT, dry fields, roadsides, alluvial plains, and ledges; RANGE, southern and western Maine, northern New Hampshire and southward at low elevations.

This blackberry is closely related to *R. recurvicaulis,* but at times seems markedly distinct. In its best marked states it occurs in large doming and trailing colonies on sandy soil, with fruit of superior quality.

REPRESENTATIVE SPECIMENS: MAINE: YORK CO., Kennebunkport, July 6, 1905, *Blanchard* (NEBC). NEW HAMPSHIRE: COÖS CO., Shelburne, August 9, 1921, *Deane* (NEBC); CARROLL CO., Tamworth, *Hodgdon & Steele 7782* (NHA); Ossipee, July 14, 1951, *Steele* (NHA); Sandwich, *Steele & Hodgdon 764* (STEELE); GRAFTON CO., Holderness, *Hodgdon, Steele & Lincoln 11317* (NHA); Plymouth, *Hodgdon & Steele 10918* (NHA); STRAFFORD CO., Milton, *Steele & Hodgdon 2932* (STEELE); Durham, *Hodgdon, Pike & Schreiber 7260* (NHA); ROCKINGHAM CO., Deerfield, *Steele & Hodgdon 3769* (STEELE); Seabrook, *Hodgdon & Steele 10919* (NHA); HILLSBORO CO., Pelham, *Hodgdon & Eldredge 7256* (NHA). MASSACHUSETTS: ESSEX CO., Newburyport, *Steele 3834* (STEELE); PLYMOUTH CO., Marshfield, July 4, 1914, *Knowlton* (NEBC); BARNSTABLE CO., Chatham, *Fernald & Long 18593* (NEBC); Harwich, *Steele & Hodgdon 3924* (STEELE); Sandwich, *Steele & Hodgdon 3895* (STEELE); DUKES CO., West Tisbury, *Fernald & Fogg 920* (NEBC); NANTUCKET CO., Nantucket Island, *Bicknell 11952* (NEBC); WORCESTER CO., Sterling, *Steele & Hodgdon 3897* (STEELE). RHODE ISLAND: NEWPORT CO., Portsmouth, July 28, 1924, *Sanford* (NEBC, Cotype of *R. rhodinsulans* Bailey).

6. *Rubus hispidus* L. PRIMOCANE prostrate and often tip-rooting in late summer or sometimes trailing over vegetation; FLORICANE prostrate or trailing; ARMATURE of thin hooked prickles resistant to touch or of soft green to purple bristles 2-3 mm long, 0-2000 per dm; DIAMETER OF CANES 1-2(3) mm; PRIMOCANE LEAFLETS 3 in number, occasionally 5, *lustrous, coriaceous* (sometimes dull), tending

to be evergreen, ratio of width to length 0.65 or more, obovate (broadest above the middle), *apex obtuse*, *abruptly pointed* or *acute* (never acuminate), the base rounded or subcuneate, 3.5-5(7) cm long, glabrous above and beneath, teeth somewhat rounded or abruptly pointed; DIMENSIONS OF COMPOUND LEAF 6×6-9×9 cm; INFLORESCENCE a compact raceme 2-4.5 cm long with 4-10 flowers on ascending to divergent pedicels, the axis pilose, setae often present, glands lacking or few and of uniform length; *late flowering*, FRUIT usually not developing or, if maturing, small and sour; HABITAT, fields, open woods especially pine, gravel pits, peaty soil and peat bogs; RANGE, common throughout New England at low elevations.

This is one of the oldest and best-marked species. Except when reclining on vegetation, it is low-trailing or prostrate and tip-rooting, the lowest of the blackberries. The armature is of bristles or weak prickles not painful to touch. The leaves are small, obovate, coriaceous and usually shiny. These features serve to easily identify this blackberry in most cases. Like some of the others, it grows in a variety of situations, but is the only one to invade acid peat bogs.

It flowers later than most species and the fruit, if it develops at all, is sour and of inferior quality.

The authors have investigated in detail its hybridization with *R. setosus* (Rhodora 65: 262-270). These hybrids are frequent and several have been designated as species. The hybrids frequently backcross with one of the parents, and the introgression of *R. setosus* into the plant gives rise to forms of *R. hispidus* which are not typical and may suggest new species. There is fairly good evidence of hybridization with *R. allegheniensis* and *vermontanus* but the details need to be worked out.

A large-leafed form of *Rubus hispidus* occurs with leaves twice as large as the typical but similar in other respects. Although at times this may appear to be distinctive, there is insufficient evidence to consider it a separate species.

REPRESENTATIVE SPECIMENS: MAINE: PENOBSCOT CO., Orono, July 9, 1888, *Fernald* (NEBC); SOMERSET CO., Lexington Plantation, *Pease 34502* (NEBC); WASHINGTON CO., Machias, August 13, 1942, (NEBC); Hancock Co., Mt. Desert, July 14, 1897, *Williams* (NEBC); WALDO CO., Burnham, July 24, 1940, *Bean* (NEBC); KNOX CO., Friendship, *Pease 747* (NEBC); LINCOLN CO., Southport, August 1, 1894, *Fernald* (NBEC); Boothbay Harbor, *Hodgdon 12254* (NHA);

SAGADAHOC CO., Georgetown (Five Islands), *Rehder 1045* (GH); ANDROSCOGGIN CO., East Livermore, *Furbish* (NEBC); YORK CO., Alfred, *Fernald & Long 13893* (NEBC). NEW HAMPSHIRE: COÖS CO., Colebrook, *Pease 29760* (NEBC); Jefferson, *Pease 33126* (NEBC); CARROLL CO., Madison, June 28, 1951, *Steele* (NEBC); Tamworth, *Steele 2859* (STEELE); GRAFTON CO., Waterville, *Steele 2921* (STEELE); STRAFFORD CO., Milton, *Hodgdon & Steele 11202* (NHA); Durham, *Hodgdon 12168* (NHA); BELKNAP CO., Alton, *Hodgdon & Steele 12191* (NHA); MERRIMACK CO., Bradford, *Hodgdon, Steele, Lincoln & Harrington 7443* (NHA); SULLIVAN CO., Charlestown, *Hodgdon & Steele 11363* (NHA); ROCKINGHAM CO., Northwood, *Hodgdon & Steele 11195* (NHA); HILLSBORO CO., Peterboro, October 3, 1907, *Batchelder* (NEBC); CHESHIRE CO., Rindge, August 19, 1916, BATCHELDER (NEBC). VERMONT: ORLEANS CO., East Charleston, *Pease 34755* (NEBC); CHITTENDEN CO., June 27, 1931, *Kittredge* (NEBC); WINDSOR CO., North Woodstock, July 15, 1914, *Forbes* (NEBC); RUTLAND CO., Castleton, August 20, 1940, *Knowlton* (NEBC); WINDSOR CO., Stratton, July 15, 1912, *Wheeler* (NEBC). MASSACHUSETTS: ESSEX CO., Rockport, *Forbes 1902* (NEBC); MIDDLESEX CO., Billerica, August 20, *Manning* (NEBC); BRISTOL CO., Westport, September 10, 1916, *Sanford* (NEBC); NANTUCKET CO., Nantucket, June 24, 1910, *Bicknell* (NEBC); WORCESTER CO., Holden, July 7, 1946, *Gates & Gates* (NEBC); FRANKLIN CO., Rowe, May 15, 1915, *Harger & Schweinfurth* (NEBC); BERKSHIRE CO., Sandisfield, July 19, 1912, *Hoffman* (NEBC). RHODE ISLAND: PROVIDENCE CO., Providence, June 1878, *W. W. Bailey* (NEBC); WASHINGTON CO., South Kingston, June 10, 1927, *Bill, Eaton & Gilbert* (NEBC); NEWPORT CO., Block Island, August 13, 1919, *Graves* (NEBC). CONNECTICUT: WINDHAM CO., Thompson, July 6, 1921, *Weatherby* (NEBC); HARTFORD CO., East Hartford, *Clark & Weatherby 130* (NEBC); NEW LONDON CO., Stonington, *Hodgdon & Steele 14837* (NHA); NEW HAVEN CO., Oxford, August 4, 1901, *Harger* (NEBC).

7. *Rubus setosus* Bigel. PRIMOCANE arching to erect (sometimes doming) of medium height; FLORICANE reclining or trailing on ground; ARMATURE of *abundant soft bristles and glands* (600) 2000-5000 per dm; CANE DIAMETER 2-5 mm; PRIMOCANE LEAFLETS 5, *chartaceous with impressed veins*, elliptic to obovate, usually broadest at middle, ratio of width to length 0.5 — 0.7, acute or acuminate, 6-11 cm. long, glabrous above and beneath, teeth acute, leaf-base rounded to cuneate; dimensions OF COMPOUND LEAF 6×6-14×14; INFLORESCENCE a compact to diffuse raceme 7-11 cm long; late-flowering, number of flowers 5-11; floral axis pubescent, bristles often present, glands frequent to abundant on stalks of uneven lengths; FRUIT failing to develop or of poor quality, small; HABITAT, alluvial plains, poorly drained soil, grassy swamps, open land; RANGE, common in northern New England, becoming less frequent southward to central Connecticut, at low elevations.

This is a long-recognized and distinctive species best developed in poorly drained soil and alluvial meadows. It oftens grows in swales or bushy swamps but hardly ever in peat bogs. It is essentially an erect plant of medium height with rather slender canes. The abundant soft bristles are characteristic. These are not unpleasant to touch as compared with the sharp thin prickles of *R. vermontanus*. In deep vegetation the plant grows tall, the bristles may be much less numerous, and the floricanes poorly developed and difficult to locate. The fruit usually does not develop and when it does it is small and of inferior quality.

REPRESENTATIVE SPECIMENS: MAINE: PENOBSCOT CO., Winn, *Fernald & Long 13889* (NEBC); PISCATAQUIS CO., Brownville, *Parlin 1886* (GH); FRANKLIN CO., Farmington, July 24, 1915, *Knowlton* (NEBC); OXFORD CO., Bethel, August 7, 1929, *Wheeler* (NEBC); WASHINGTON CO., Princeton, July 22, 1909, *Fernald* (GH); HANCOCK CO., Mt. Desert, July 2, 1896, *Rand* (NEBC); ANDROSCOGGIN CO., South Poland, 1895, *Furbish* (NEBC); CUMBERLAND CO., Baldwin, *Fernald & Long 13885* (NEBC); YORK CO., South Berwick, September 26, 1897, *Parlin* (NEBC). NEW HAMPSHIRE: COÖS CO., Berlin, *Pease 17060* (NEBC); CARROLL CO., Ossipee, August 4, 1943, *Knowlton* (NEBC); North Conway, *Hodgdon & Steele 11204* (NHA); GRAFTON CO., Easton, *Fernald 15826* (NEBC); Plymouth, *Hodgdon & Steele 11173* (NHA); STRAFFORD CO., Rochester, *Hodgdon 3461* (NEBC); BELKNAP CO., Laconia, *Fernald 15776* (NEBC); SULLIVAN CO., Langdon, August 23, 1963, *Richardson & Seymour* (NEBC); ROCKINGHAM CO., Nottingham, *Hodgdon 10199* (NEBC); HILLSBORO CO., Peterboro, July 10, 1888, *Deane* (NEBC). VERMONT: ESSEX CO., Brighton, *Pease 33683* (NEBC); FRANKLIN CO., Berkshire, July 1916, *Knowlton* (NEBC); ADDISON CO., Ripton, July 19, 1900, *Brainerd & Eggleston* (NEBC); RUTLAND CO., Wallingford, *Brainerd 1225* (NEBC); WINDHAM CO., Stratton, *Underwood 3038* (NEBC). MASSACHUSETTS: MIDDLESEX CO., Lexington, August 19, 1908, *Kennedy* (NEBC); WORCESTER CO., Ashland, *Gates 31415* (NEBC); Sterling, *Steele & Hodgdon 3947* (NHA, STEELE). CONNECTICUT: WINDHAM CO., Hampton, *Hunnewell 12620* (NEBC); NEW LONDON CO., Franklin, June 26, 1905, *Graves* (GH); TOLLAND CO., Bolton, *Weatherby 3166* (NEBC); Strafford, August 29, 1903, *Graves* (GH); HARTFORD CO., Southington, *Andrews 5014* (NEBC); LITCHFIELD CO., Colebrook, *Weatherby 2668* (NEBC); FAIRFIELD CO., Botsford, June 27, 1897, *Eames* (NEBC).

8. *Rubus vermontanus* Blanch. PRIMOCANE erect or arching, of medium height (0.3-0.9), less often doming or high trailing; FLORICANE arching or reclining; ARMATURE usually of *acicular straightish prickles 2-4 mm long, stiff and unpleasant to touch*, less often hooked

50-500 (10-250) per dm; DIAMETER OF CANE 2-4 mm; PRIMOCANE LEAFLETS 5, chartaceous or subchartaceous, veins impressed, rhombic, elliptic or obovate, broadest at middle or above middle, ratio of width to length 0.5-0.7, apex acute or abruptly acuminate, 6-12 cm long, glabrous on upper and lower surfaces usually with slight pubescence on main veins evident under magnification, teeth acute, base rounded to cuneate, *central petiolules 1.4-2.0 (0.8-0.3) cm long, longest lateral petiolules 0-1 (1.7) cm long;* DIMENSIONS OF COMPOUND LEAF 9×9-18×18 cm; INFLORESCENCE similar to *R. setosus* but thin prickles usually present as well as glands; early flowering; FRUIT small, often underdeveloped, of poor to fair quality; HABITAT, lumbered areas, sterile fields, thickets and bases of cliffs; RANGE, northern New England common, becoming less abundant southward to Connecticut, medium and low elevations.

This is a distinctive species in northern New England, common in open lumbered areas and run out fields. It most closely resembles *R. elegantulus* and at times is difficult to distinguish from that species, perhaps because of hybridization. The following characters serve to separate it; height averaging low, 1-3′ (*R. elegantulus*, 2-4′) ; length of petiolules, central usually less than 2 cm, (*R. elegantulus* more than 1 cm) ; floral axis frequently with glands, (*R. elegantulus* never with glands). In growth-habit and appearance this plant resembles *R. setosus*, but the armature is distinctively different. Although the leaves apparently are glabrous, some hairs can usually be seen under magnification on the main veins beneath. However these two species frequently hybridize forming various intermediate states, many of which have been designated as *R. Groutianus*. *Rubus vermontanus* also occurs in doming, excessively prickly forms which have been designated as *R. severus*. This possibly represents introgression with some of the flagellares. *Rubus vermontanus* appears to hybridize with several other species producing puzzling mongrel populations. In southern New England it tends to be replaced by *R. semisetosus* and to hybridize with it.

At high elevations above 300 feet in boggy places a blackberry occurs which we have assigned to *R. elegantulus* but it has some of the characteristics of *R. vermontanus*. It does not seem to be a hybrid of them, however, as neither of the putative parents is present.

REPRESENTATIVE SPECIMENS: MAINE: AROOSTOOK CO., Fort Fairfield, August 10, 1909, *Fernald & Wiegand* (GH); PENOBSCOT CO., Stacyville, July 3, 1900, *Churchill* (NEBC); PISCATAQUIS CO., Dover, September 2, 1896, *Fernald* (NEBC); FRANKLIN CO., Chain of Ponds, *Pease & Bean 33605* (NEBC); OXFORD CO., Canton, *Parlin 2002* (NEBC); Mason, *Hodgdon & Steele 11313* (NHA); WASHINGTON CO., Cutler, July 30, 1902, *Furbish* (NEBC); Pembroke, August 18, 1909, *Fernald & Wiegand* (GH); HANCOCK CO., Mt. Desert, July 1, 1896, *Rand* (NEBC); KNOX CO., Thomaston, *Bissell, Fernald & Chamberlain 7697* (NEBC); LINCOLN CO., Boothbay (Ocean Point), *Hodgdon 12269* (NHA); YORK CO., Kennebunk, July 3, 1905, *Blanchard* (NEBC); Biddeford, *Hodgdon & Steele 12255* (NHA). NEW HAMPSHIRE: COÖS CO., Shelburne, *Fernald & Pease 15746* (NEBC); CARROLL CO., North Conway, *Hodgdon & Steele 11208* (NHA); Conway, *Pease 28776* (NEBC); GRAFTON CO., Woodstock, *Fernald 11743* (NEBC); Plymouth, *Hodgdon & Steele 11211* (NHA); STRAFFORD CO., New Durham, *Steele & Hodgdon 3703* (STEELE); Rollinsford, *Hodgdon 11367* (NHA); BELKNAP CO., Laconia, *Fernald 15777* (NEBC, as var. *viridiflorus*); Alton, *Hodgdon & Steele 12195* (NHA); SULLIVAN CO., Grantham, *Hodgdon, Steele, Page & Stearns 7781* (NHA); ROCKINGHAM CO., Seabrook, *Hodgdon & Steele 1180* (NHA); HILLSBORO CO., Nashua, *Hodgdon & Steele 11299* (NHA). VERMONT: ESSEX CO., Ferdinand, *Pease 25694* (NEBC); ORLEANS CO., Westmore, *Floyd 2264* (NEBC); ADDISON CO., Ripton, July 27, 1914, *Brainerd* (NEBC); RUTLAND CO., East Wallingford, June 27, 1909, *Kent* (NEBC); WINDHAM CO., West Dover, August 13, 1928, *Eaton* (NEBC); Windham, June 20, 1904, *Blanchard* (GH type; BENNINGTON CO., Woodford, June 29, 1939, *Knowlton* (NEBC). MASSACHUSETTS: ESSEX CO. Plum Island, *Steele & Hodgdon 3833* (STEELE); BERKSHIRE CO., Becket, July 9, 1920, *Hoffmann* (NEBC). RHODE ISLAND: PROVIDENCE CO., Diamond Hill, *E. J. Palmer 45604* (GH as *R. significans* Bailey). CONNECTICUT: WINDHAM CO., Thompson, *Weatherby 5051* (NEBC); HARTFORD CO., Berlin, *Hodgdon & Steele 14838* (NHA); East Hartford, *Ashe & Weatherby 5356* (NEBC).

9. *Rubus semisetosus* Blanch. PRIMOCANE erect or arching, of medium height (0.3-0.9 m); FLORICANE erect or reclining; ARMATURE of *acicular to thin prickles 2-4 mm long*, 25-100 per dm; DIAMETER OF CANE 25 mm; PRIMOCANE LEAFLETS 5 (occasionally 3), membranaceous or chartaceous, ovate or rhombic, 6-9 cm long, ratio of width to length averages 0.6-0.7, glabrous or occasionally minutely pilose above, *strongly pilose to velvety beneath*, base of leaflet round to cuneate rarely cordate, central petiolule 1-1.8 cm long, longest lateral petiolules 0.2-0.7 mm long; DIMENSIONS OF COMPOUND LEAF 8×8-14×14 (17×17) cm; INFLORESCENCE similar to *R. vermontanus*, floral axis always pubescent, thin prickles often present, glands rarely present; FRUIT undeveloped or poor; HABITAT, swales, thickets

and open fields; RANGE, coast of Maine, southern New Hampshire occasional, moderately common from Massachusetts southward.

This blackberry is most closely related to *Rubus vermontanus* and replaces it in southern New England. The two differ in pubescence of leaves; *R. vermontanus* has leaves glabrous on the underneath side with a minute pubescence on the veins whereas *R. semisetosus* has leaves soft-velvety to the touch. In southern New Hampshire some plants with only a slight pubescence are found along with good *R. semisetosus*. Farther south *R. vermontanus* is rare with *R. semisetosus* replacing it. Thus there appear to be two distinct species that have a transition zone of intergradation.

Rubus semisetosus is also close to the Arguti, especially to *R. argutus*. It is a smaller plant, however, and the leaf-shape is usually distinctive. *Rubus semisetosus* typically has rather broad obovate or rhombic leaves, whereas *R. argutus* has narrow lanceolate leaves. It definitely hybridizes with *R. setosus* and *R. vermontanus* and probably with other species.

REPRESENTATIVE SPECIMENS: MAINE: HANCOCK CO., Mt. Desert Island, July 8, 1894, *Rand* (NEBC); Mt. Desert Island, September 7, 1896, *Rand* (NEBC). NEW HAMPSHIRE: ROCKINGHAM CO., Nottingham, *Hodgdon 14839* (NHA); HILLSBORO CO., Merrimack. *Steele & Hodgdon 3830* (STEELE). MASSACHUSETTS: MIDDLESEX CO., Pepperel, *Hodgdon & Steele 14880* (NHA); Concord, June 16, 1962, *Eaton 5205* (NEBC); Concord, July 16, 1961, *Eaton* (NHA); NORFOLK CO., Millis, *Hodgdon & Steele 14841* (NHA); Walpole, *Hodgdon & Steele 14842* (NHA); Medway, *Hodgdon & Steele 14843* (NHA); PLYMOUTH CO., Carver, *Fernald, Hunnewell & Long 9667* (NEBC); BARNSTABLE CO., Brewster, *Steele & Hodgdon 3878* (STEELE); WORCESTER CO., Sterling, *Hodgdon & Steele 14844* (NHA); HAMPDEN CO., Springfield, *Weatherby 5918* (NEBC). RHODE ISLAND: WASHINGTON CO., Kingston, July 30, 1906, *Blanchard* (GH type); Kingston, *Steele & Hodgdon 3877* (STEELE); Kenyon, *Fernald & Weatherby 843* (GH, NHA). CONNECTICUT: HARTFORD CO., East Hartford, *Weatherby 4905* (NEBC); New Canaan, *Steele 3948* (STEELE); NEW HAVEN CO., North Branford, August 17, 1940, *Harger* (NEBC); FAIRFIELD CO., Greenwich, June 20, 1913, *Bissell & Weatherby* (NEBC).

10. *Rubus cuneifolius* Pursh PRIMOCANES stiff-erect to arching or occasionally trailing, of medium height (0.3-0.9 m); FLORICANES similar, often branched; ARMATURE of numerous (20-50 per dm) thin

to stout *stiff straight or hooked prickles;* PRIMOCANES *usually* PUBESCENT, DIAMETER OF CANE 2-4 mm; PRIMOCANE LEAFLETS 3 or 5, chartaceous or subcoriaceous, glabrous above, closely *white-or gray-tomentose beneath, obovate, base cuneate,* broadest above the middle, ratio of width to length averaging 0.6-0.7, apex rounded or abruptly pointed, length 2-5 cm; DIMENSIONS OF COMPOUND LEAF average 6×6-8×8 cm, INFLORESCENCE prickly-pubescent, of few-flowered small racemes or cymes; early flowering; FRUIT dry and seedy or sweet and of good quality; HABITAT, sandy or rocky and open dry lands; RANGE, southern Connecticut, where uncommon and isolated in Hillsboro, N. H.

This is a very distinctive southern species of the Coastal Plain and Lower Piedmont which enters New England only in southern Connecticut except for a highly disjunct station in Hillsboro County, New Hampshire.

REPRESENTATIVE SPECIMENS: NEW HAMPSHIRE: HILLSBORO CO., Hillsboro, October 22, 1966, *William Cottrell* (NEBC, NHA). CONNECTICUT: HARTFORD CO., Southington, June 13, 1900, *Bissell* (NEBC); MIDDLESEX CO., Portland, June 24, 1897, *Starmer* (NEBC); NEW HAVEN CO., North Branford, June 18, 1927, *Harger* (NEBC); LITCHFIELD CO., Woodbury, August 12, 1926, *Harger* (NEBC); FAIRFIELD CO., Bridgeport, July 4, 1890, *Johnson* (NEBC).

11. *Rubus canadensis* L. PRIMOCANE and FLORICANE 1-2 (2.5) m high, erect to somewhat arching; *armature* of *acicular to weak prickles or none,* 0.5-3 mm long, 0-7 (9) per dm; DIAMETER OF PRIMOCANE 2-7 mm; PRIMOCANE LEAFLETS 5, membranaceous, ovate, ratio of width to length 0.5-0.7, acuminate or occasionally abruptly pointed, 7-14 cm long, *glabrous on both surfaces,* cordate to rounded at base, *central petiolules 1.5-5 cm long, longest lateral petiolules 0.5-2 cm;* dimensions of compound leaf 10×10-24×24 cm; INFLORESCENCE varying from long racemes (11 cm long by 5 cm) to short racemes (7 cm long by 6 cm) to extremes of small diffuse racemes with thin pedicels, the flowers 6-14 in number; axis of inflorescence and pedicels pubescent to subglabrous, *lacking glands and prickles;* flowering in midseason; FRUIT sour, often poorly developed, occasionally of fair quality; HABITAT, moist thickets, openings in northern hardwood forest, bases of cliffs, occasionally ascending mountains to 1100 m; RANGE, northern New England south to mountainous areas of Massachusetts and Connecticut, common in north, less common southward.

This species, along with *R. elegantulus,* and *R. vermontanus* appear to be the three northernmost blackberries, all occurring in Newfoundland. In New England *R. canadensis* is characteristic of mountainous areas and ascends higher than any other blackberry. It is often found in open

hardwoods or near ledges at 2000 feet and has been collected on Mt. Washington at 3600 feet which is the highest recorded altitude for any blackberry in New England. It occurs in a variety of lowland habitats but its most characteristic environment seems to be open hardwoods and moist thickets.

It is usually a distinctive well-marked plant, a high blackberry with glabrous leaves and a stem nearly devoid of prickles, the few present being small and weak. Close examination of the leaves under magnification indicates that they are either completely glabrous or have a few hairs on the main nerves. Any pubescence that could be detected without a lens would indicate there was introgression with some other species, presumably *R. pensilvanicus*.

REPRESENTATIVE SPECIMENS: MAINE: AROOSTOOK CO., Van Buren, July 17, 1914, *Knowlton* (NEBC); PENOBSCOT CO., Bangor, June 27, 1909, *Blanchard* (GH); PISCATAQUIS CO., Abbot, *Fernald & Long 13879* (NEBC); FRANKLIN CO., Industry July 9, 1896, *Fernald* (NEBC); OXFORD CO., Greenwood, June 13, 1931, *Bill, Eaton, Fernald, Griscom & Hunnewell* (NEBC); WASHINGTON CO., Pembroke, July 7, 1909, *Fernald & Wiegand* (GH); HANCOCK CO., Dedham, *Fernald & Long 13877* (NEBC); WALDO CO., Islesboro, *Woodward, Bissell & Fernald 9672* (NEBC); LINCOLN CO., Monhegan Island, *Hodgdon & Hodgdon 12808* (NHA); ANDROSCOGGIN CO., South Poland, 1893, *Furbish* (NEBC); YORK CO., Kittery, *Fernald & Long 13880* (NEBC). NEW HAMPSHIRE: COÖS CO., Dartmouth College Grant, *Pease & Harris, 33915* (NEBC); Dummer, *Hodgdon & Steele 11269* (NHA, STEELE); CARROLL CO., Sandwich, *Steele 3547* (STEELE); GRAFTON CO., Thornton, *Hodgdon & Steele 12373* (NHA); Franconia, August 7, 1919, *Deane* (NEBC); STRAFFORD CO., Barrington, *Hodgdon & Steele 7279* (NHA); BELKNAP CO., Gilford, *Fernald 15654* (NEBC); HILLSBORO CO., Peterboro, *Ware 4127* (NEBC); Hollis, *Steele & Hodgdon 4008* (STEELE); CHESHIRE CO., Gilsum, *Fernald 321* (NEBC); Alstead, June 14, 1903 — August 16, 1903, *Blanchard* (GH all marked type). VERMONT: ORLEANS CO., Lowell, August 9, 1915, *Winslow* (NEBC); ADDISON CO., Ripton, July 5, 1914, *Brainerd* (NEBC); WINDSOR CO., North Woodstock, July 15, 1914, *Forbes* (NEBC); RUTLAND CO., Pittsfield, July 27, 1933, *Knowlton* (NEBC); WINDHAM CO., Marlboro, June 28, 1939, *Knowlton* (NEBC). MASSACHUSETTS: WORCESTER CO., Princeton, July 22, 1913, *Weatherby* (NEBC); FRANKLIN CO., Ashfield, June 19, 1921, *Churchill, Hunnewell, Knowlton & Svenson* (NEBC); BERKSHIRE CO., New Marlboro, July 12, 1912, *R. Hoffmann* (NEBC). CONNECTICUT: TOLLAND CO., Union, August 31, 1903, *Graves* (GH); HARTFORD CO., Hartland,

Weatherby 3093 (NEBC); LITCHFIELD CO., Colebrook, September 5, 1909, *Fernald* (GH); FAIRFIELD CO., Danbury, *Blewitt 2047* (NEBC).

12. *Rubus elegantulus* Blanch. PRIMOCANE and FLORICANE arching or less often doming 0.3-1 m high; *armature* of *thin to acicular prickles* 1-4 mm long, 10-60 (100) per dm; DIAMETER OF CANE 3-6 mm; PRIMOCANE LEAFLETS 5, membranaceous (occasionally chartaceous), lanceolate, ovate or elliptic, 7-14 cm long, apex acuminate or sometimes abrupt-acuminate, base of central leaflet cordate, lateral leaflet rounded, *glabrous above and below; petiolules of central leaflet 2.5-4 (1.5-5) cm long, longest lateral petiolules 1-2 (0.3-2.5) cm long;* DIMENSIONS OF COMPOUND LEAF 11×11-22×22 cm; INFLORESCENCE in shape similar to *R. vermontanus*, 6-17 cm long; floral axis pubescent often with small prickles but no glands; flowering in midseason, the number of flowers 3-15 (21); FRUIT undeveloped or small (rarely large and of good quality); HABITAT, old fields, moist or dry thickets, woods, bases of ledges, ascending to 1000 m in moist peaty soil; RANGE, northern New England where common, becoming less abundant southward in New Hampshire and Vermont and occasional in areas of high elevation in Massachusetts.

Although this species was not recognized by Bailey, it seems to be a distinct and wide-ranging blackberry of northern New England. It would be difficult to understand the blackberry-flora without recognizing this as a species. It has been considered as a variety of *R. canadensis*, from which it is separated principally by the number of prickles on the primocane, and there are occasional states of *R. canadensis* that are difficult to assign to either species. In most cases, however, *R. elegantulus* is closer to *R. vermontanus*, and can be distinguished only by careful examination as noted in the description of the latter species. Some of the mountain-forms are difficult to assign to either species and possibly are stable hybrid colonies of considerable age. Thus *R. elegantulus* represents a transition between *R. vermontanus* and *R. canadensis*, but has a range of sufficient extent and is constant enough to be maintained as a species in its own right. It appears to cross more frequently with *R. setosus* than any other. Shorter hybrids are impossible to distinguish from hybrids of *R. setosus* and *R. vermontanus*, except by taking note of the occurrence of the putative parents in the area.

The leaves are typically glabrous beneath as in *R. cana-*

densis. Good *R. elegantulus* may have very light pubescence on the main veins not noticeable without a lens. More obvious pubescence indicates introgression with *R. pensilvanicus*.

REPRESENTATIVE SPECIMENS: MAINE: OXFORD CO., Mason, *Steele & Hodgdon 2773* (STEELE); WASHINGTON CO., Pembroke, July 6, 1909, *Fernald & Wiegand* (GH); HANCOCK CO., Mt. Desert Island, July 18, 1896, *Rand* (NEBC); LINCOLN CO., Boothbay Harbor, *Hodgdon 12199* (NHA); South Bristol, *Hodgdon 12174* (NHA); YORK CO., Kennebunkport, *Steele & Hodgdon 3701* (STEELE); York, *Steele & Hodgdon 3744* (STEELE). NEW HAMPSHIRE: COÖS CO., Northumberland, *Fernald & Pease 15832* (NEBC); Dummer, *Fernald & Pease 15792* (NEBC); CARROLL CO., Sandwich, *Steele 3932* (STEELE); Madison, *Steele 3543* (STEELE); GRAFTON CO., Bath, *Fernald 15668* (NEBC); Franconia, *Hodgdon & Steele 11375* (NHA, STEELE); Rumney, *Hodgdon & Steele 11271* (NHA, STEELE); STRAFFORD CO., New Durham, *Hodgdon 9426* (NHA); Milton, *Hodgdon & Steele 11270* (NHA); ROCKINGHAM CO., Seabrook, *Hodgdon & Steele 11261* (NHA); HILLSBORO CO., Sharon, *Hodgdon 7216* (NHA). VERMONT: ESSEX CO., Granby, *Pease 26804* (NEBC); WINDHAM CO., Saxtons River, *Steele 3548* (STEELE); BENNINGTON CO., Woodford, June 29, 1939, *Knowlton* (NEBC). MASSACHUSETTS: BERKSHIRE CO., Pittsfield, July 14, 1919, *Hoffmann* (NEBC). CONNECTICUT: TOLLAND CO., Willington, *Weatherby 5332* (NEBC).

13. *Rubus alleghenicnsis* Porter. PRIMOCANE and FLORICANES erect to arching 1-2 m high, sometimes low-doming in late summer; ARMATURE of broad-based stout or occasionally thin prickles 2-7 mm long, 1-20 per dm.; PRIMOCANES glabrous or pubescent, mostly glandular particularly on upper parts and early in the season; FLORICANES usually glabrous and glandless; DIAMETER OF PRIMOCANE 4-8 (3-9) mm; PRIMOCANE-LEAFLETS 5, membranaceous ovate, ratio of width to length 0.6-0.75, acuminate, the terminal leaflets cordate to subcordate, the lateral leaflets rounded to subcordate at base, 8-15 mm long, glabrous to pubescent above, *velvety beneath*, central petiolules 2-6 cm long and longest laterals 1.5-5 m long; DIMENSIONS OF COMPOUND LEAF 12×12-23×23 cm; INFLORESCENCE when best developed and most typical forming cylindric racemes 8-20 cm long but often reduced to short racemes or corymbs to 3 cm long, flowers 9-22 in number but at times reduced to as few as 3 in the shorter clusters, axis of inflorescence pubescent and with *abundant glands*, with or without prickles; pedicels divergent to ascending 1.5-5 cm long, sometimes with weak scattered prickles; early flowering; FRUIT elongate to thimble-shaped or less often globular, of good quality; HABITAT, roadsides, old fields and cut over woods, RANGE, throughout New England at low elevations, common.

In spite of considerable variation, this is one of the most distinctive and earliest known species of blackberry. It is the common high blackberry, when well developed, producing long cylindrical racemes of good fruit. It is widespread, occurring throughout New England in fields and roadsides and quickly invading new lumbered areas. Chromosome counts indicate that it is one of the few diploid species. In good sites the globular, or more commonly thimble-shaped, fruits occur in abundance and are easy to pick.

This species and some of the Arguti occasionally have flowering primocanes, forming inflorescences that would be difficult to classify, unless their true nature is appreciated. An inflorescence with each single flower subtended by a leaf belongs in this category. Primocanes are fresh-green with buds at the end; floricanes are red or purple often with dead ends.

Although *R. allegheniensis* is normally arching and 4 to 6′ tall, stunted specimens only 1′ or 2′ high are frequent. These might be mistaken for another species, but the glandular floral axis and the soft pubescence on the underneath side of the leaves give clues as to the true nature of the plant. Colonies of this species have been found in which some of the outer plants dome and reach the ground. This may represent an extreme state of the plant modified by environmental factors or it may represent introgression with another species.

Rubus allegheniensis, on occasion, hybridizes with most other species. These hybrids are infrequent to rare, the most frequent being a cross with *R. setosus* which gives rise to various forms intermediate between the two parents, several of which have been designated as species.

REPRESENTATIVE SPECIMENS: This species is well enough understood and clearly enough marked to require a minimum of specimen citations. MAINE: PENOBSCOT CO., Milford, *Fernald 13867* (NEBC); PISCATAQUIS CO., Dover, September 1, 1896, *Fernald* (NEBC); SOMERSET CO., Fairfield, *Fernald & Long 13862* (NEBC); WASHINGTON CO., Lubec, *Hodgdon & Pike 7223* (NHA); HANCOCK CO., Dedham, *Fernald & Long 13861* (NEBC); KNOX CO., Isle au Haut, September 3, 1918, *Kidder* (NEBC); LINCOLN CO., Southport, August 2, 1894, *Fernald* (NEBC); ANDROSCOGGIN CO., Auburn, August 29, 1932, *Bean*

(NEBC); YORK CO., Wells, *Fernald & Long 13860* (NEBC). NEW HAMPSHIRE: COÖS CO., Dummer, *Fernald & Pease 15793* (NEBC); CARROLL CO., Conway, *Hodgdon & Steele, 11277* (NHA); GRAFTON CO., Woodstock, *Fernald 11752* (NEBC); STRAFFORD CO., Durham, *Hodgdon 3031* (NEBC); MERRIMACK CO., Hooksett, August 24, 1925, *Batchelder* (NEBC); SULLIVAN CO., Plainfield, August 9, 1962, *Cowden, Eaton, Hodgdon, Poole & Wilson* (NHA); ROCKINGHAM CO., Rye, *Pease 16937* (NEBC); CHESHIRE CO., Hinsdale, August 23, 1919, *Batchelder* (NEBC). VERMONT: ESSEX CO., Concord, *Pease 33722* (NEBC); ORLEANS CO., Newport, June 7, 1913, *Knowlton* (NEBC); CHITTENDEN CO., Hinesburg, July 17, 1940, *Knowlton* (NEBC); WINDSOR CO., Hartford, June 12, 1920, *Eaton & St. John* (NEBC); RUTLAND CO., Wallingford, June 21, 1909, *Kent* (NEBC); WINDHAM CO., Vernon, June 19, 1925, *Churchill & Knowlton* (NEBC). MASSACHUSETTS: ESSEX CO., Manchester, June 7, 1913, *Hubbard* (NEBC); MIDDLESEX CO., Concord, June 20, 1958, *Eaton* (NEBC); PLYMOUTH CO., Marshfield, June 26, 1926, *Knowlton* (NEBC); BARNSTABLE CO., Falmouth, August 9, 1927, *Fernald* (NEBC); DUKES CO., Marthas Vineyard, September 23, 1913, Bicknell (NEBC); WORCESTER CO., Douglas, *Fernald 15226* (NEBC); FRANKLIN CO., Colerain, June 18, 1921, *Churchill, Knowlton & Schweinfurth* (NEBC); HAMPSHIRE CO., Ware, September 2, 1916, *Forbes* (NEBC); BERKSHIRE CO., Sheffield, August 27, 1902, *Hoffmann* (NEBC). RHODE ISLAND: PROVIDENCE CO., East Providence, May 30, 1911, *Wiegand* (NEBC); BRISTOL CO., Barrington, May 30, 1911, *Winslow* (NEBC). CONNECTICUT: WINDHAM CO., Thompson, *Weatherby 5034* (NEBC); NEW LONDON CO., Franklin, July 5, 1912, *Woodward* (NEBC); TOLLAND CO., Bolton, *Weatherby 5318* (NEBC); HARTFORD CO., Hartland, *Weatherby 4343* (NEBC); MIDDLESEX CO., Cornwall, *Weatherby 4302* (NEBC); NEW HAVEN CO., Waterbury, *Blewitt 1314* (NEBC); LITCHFIELD CO., Norfolk, June 10, 1919, *Evans* (NEBC); FAIRFIELD CO., Danbury, July 19, 1912, *Harger* (NEBC).

14. *Rubus argutus* Link. PRIMOCANE and FLORICANE erect or high-arching (occasionally low-arching) 0.9-1.8 m high; ARMATURE of thin to stout prickles, 4-6 mm long, 10-30 per dm; DIAMETER OF CANE 3-5 (2-7) mm; PRIMOCANE-LEAFLETS 5, membranaceous, *lanceolate, narrow, the ratio of width to length* 0.4-0.45, acuminate at apex, 8-11 cm long, finely pilose to glabrous above, sparsely pilose to velvety beneath, *rounded to cuneate at base, the central base cuneate or subcuneate, the lateral rounded;* DIMENSIONS OF COMPOUND LEAF 13×13-17×17 cm; INFLORESCENCE a short diffuse raceme (corymb) 3-7 cm long and 3-5 cm across, the flowers 5-10 (4-12) in number, the axis and pedicels often with prickles, *glands* absent; medium-to late-flowering; HABITAT, thickets, edges of woods and bog-margins; RANGE, central and southern Massachusetts and southward at low elevations, uncommon.

The three species; *R. argutus, R. frondosus* and *R. pensilvanicus* are often classed as Arguti. *Rubus argutus* ap-

pears to be a distinctive blackberry, although of limited range. The leaflets are narrow, less than one half as broad as long, and the base of the central one is wedge-shaped. In other related species, the bases are rounded, or, more usually heart-shaped.

The species appears to be uncommon in New England but more frequent southward. There a number of collections from Virginia. In Massachusetts the northernmost station is south of Boston, and most of the other stations are on Cape Cod. It appears to be commonest at or near the coast and absent from upland or mountainous regions. No doubt with the development of the coast much suitable environment for it was destroyed and it may have been more common in the past.

REPRESENTATIVE SPECIMENS: MASSACHUSETTS: NORFOLK CO., Stoughton, *Blake 12127* (GH, Type of *R. Blakei* Bailey); BRISTOL CO., New Bedford, June 9, 1910, *Hervey* (NEBC); BARNSTABLE CO., Harwich, *Fernald & Long 16924* (GH, type of *R. paludivagus* Fernald); Bourne, *Fernald & Clark 16898* (NEBC); Barnstable, *St. John & Hubbard 11726* (NEBC); Falmouth, August 9, 1927, *Fernald 608* (NEBC); Brewster, *Steele & Hodgdon 3915* (NHA, STEELE). CONNECTICUT: NEW LONDON CO., Franklin, July 8, 1915, *Woodward* (NEBC).

15. *Rubus frondosus* Bigel. PRIMOCANE and FLORICANE erect to arching or even doming to 0.9-1.2 m high; ARMATURE of *thin to stout straight prickles 4-6 mm long, 4-60 in number* per dm; DIAMETER OF CANE 4-6 (3-7) mm; PRIMOCANE LEAFLETS 5, *subchartaceous to chartaceous* (occasionally membranaceous), ovate to obovate-rhombic, *leaflets often short and broad, ratio of width to length 0.6-0.8 (0.55)*, acuminate, 6-12 cm long, subglabrous to glabrous above, velvety below, terminal leaflet cordate to subcordate or rounded at base, lateral leaflets with bases rounded to subcuneate; petiolules of central leaflet from 1.2-3 (4.5) cm long, of middle lateral leaflets 0.1-1 (2.3) cm long; DIMENSIONS OF COMPOUND LEAF 11×11-19×19 cm; INFLORESCENCE a compact raceme (corymb) 4-9 cm long by 2-4 cm broad, flowers 3-10 (2-12) in number, axis pilose with few to 0 prickles, *leafy bracts 1-7*, sometimes lacking, *often conspicuous;* FRUIT globular to subglobular, large, juicy and often of exceptional quality; HABITAT, thickets, old fields and roadsides; RANGE, coast of Maine, southern New Hampshire and southern Vermont southward, common at low elevations.

This species is essentially southern in distribution, reaching its northern limit along the coast of Maine, and is more

distinctive in the southern part of its range where it is as common as *R. allegheniensis* and occupies similar environments. It often has good fruits and presumably was the source of some cultivated varieties.

It is closest in appearance to *Rubus pensilvanicus* and no doubt frequently intergrades with it. There is a difference in the texture of the leaves, those of *R. frondosus* being darker and subchartaceous, which gives the plant a distinctive appearance even at a distance. The prickles tend to be stouter and more numerous than those of *R. pensilvanicus* and the fruit is of better quality.

The primocanes frequently have lateral branches which elongate and may crawl over bushes or reach the ground, thus giving the plant a doming appearance. We include the state described as *R. multispinus* in our concept of *R. frondosus*. Because there is so much variation in the degree of doming in *R. frondosus* itself it would not seem to be a reliable character on which to separate two species. In some instances the doming habit is caused no doubt by introgression with some of the trailing species.

Although there seems to be a tendency in *Rubus frondosus* to have pronounced leafy bracts in the inflorescence this is by no means a constant or reliable character; often the inflorescences in perfectly good material are no more leafy than *R. pensilvanicus*.

REPRESENTATIVE SPECIMENS: MAINE: KNOX CO., Matinicus, July 9, 1920, *C. A. E. Long* (NEBC); Isle Au Haut, August 2, 1919, *Kidder* (NEBC); LINCOLN CO., Boothbay Harbor, August 19, 1955, *Steele & Hodgdon 2154* (STEELE); Southport, *Hodgdon 7230* (NHA). NEW HAMPSHIRE: STRAFFORD CO., Durham, *Hodgdon & Steele 12188* (NHA); HILLSBORO CO., Hollis, *Steele & Hodgdon 4009* (STEELE). MASSACHUSETTS: SUFFOLK CO., Boston, June 25, 1908, *Rich* (NEBC); BARNSTABLE CO., Harwich, *Fernald 16895* (NEBC); Harwich, *Fernald 16917* (NEBC); Harwich, *Steele & Hodgdon 3925* (NHA, STEELE); Chatham, *Fernald & Long 18578* (NEBC); Brewster, *Hodgdon & Steele 14845* (NHA); DUKES CO., Chilmark, *Steele 4011* (STEELE); NANTUCKET CO., Nantucket, *Bicknell 11932* (NEBC); WORCESTER CO., Sterling, *Hodgdon & Steele 14846* (NHA); Berlin, *Hodgdon & Steele 14847* (NHA); HAMPDEN CO., Springfield, June 30, 1914, *Andrews* (NEBC). RHODE ISLAND: WASHINGTON CO., Charlestown, *Hodgdon & Steele 14848* (NHA). CONNECTICUT: NEW LONDON CO.,

Mystic, *Hodgdon & Steele 14849* (NHA); Salem, *Steele & Hodgdon 3906* (STEELE); TOLLAND CO., Stafford Springs, *Hodgdon & Steele 14850* (NHA); HARTFORD CO., Hartford, *Wright* (NEBC); Berlin, *Steele & Hodgdon 3931* (NHA, Steele); Southington, *Steele & Hodgdon 3910* (STEELE, NHA); MIDDLESEX CO., Haddam, *Hodgdon & Steele 148501* (NHA); NEW HAVEN CO., Orford, *Harger 5552* (NEBC).

16. *Rubus pensilvanicus* Poir. PRIMOCANE and FLORICANE erect to somewhat arching 0.6-2.2 m high; ARMATURE of *thin to medium prickles 2-4 (5) mm long, tending to be rather few, 0-20 (27)* per dm; DIAMETER OF CANE 4-9 (2-10) mm; PRIMOCANE LEAFLETS 5, *membranaceous to subchartaceous*, ovate, *ratio of width to length 0.55-0.75 (0.5)*, apex acuminate, 8-13(16) cm long; glabrous or nearly so above, moderately pilose to velvety beneath, leaf base cordate or subcordate to rounded; petiolules of central leaflet 2-5(6) cm long, of medium lateral leaflets 0-2.5(4.5) cm, the larger lateral petiolules frequently more than 1 cm long; DIMENSIONS OF COMPOUND LEAF 11×11-22×22(30×30), often large; INFLORESCENCE varying, from long to short and somewhat compact racemes (corymbs), flowers 7-12(4-20) in number, axis pilose with occasional prickles and no glands, *leafy bracts 1-2(0-6)*; FRUIT fair to good, not often produced in abundance; HABITAT, thickets, roadsides, swamps and woods; RANGE, throughout New England, at low elevations, scarcer northward, a scattered and not very common species.

Although this species has a wide distribution extending from northern New Hampshire southward throughout New England, it has certain puzzling aspects and is not always clearly defined. A plant from the northernmost known New Hampshire station, in Franconia Notch, resembles *R. canadensis* except for a thin pubescence on the underneath side of the leaves. Specimens from the few scattered stations immediately southward also resemble *R. canadensis* or a hybrid of *R. alleghaniensis* and *R. canadensis*. Thus there is a question about the specific identy of the northern specimens, which might account for some of the diversity.

In southern New Hampshire the plant becomes more common and better marked. The prickles instead of being infrequent and minute as in *R. canadensis* are of medium-size and more abundant. In southern New England the prickles tend toward those of *R. frondosus*.

Folders in herbaria contain some plants with slightly glandular inflorescences, which must represent some influence of *R. alleghaniensis*. Chromosome counts indicate

that this plant may contain both triploid and tetraploid elements, which might account for some of the diversity.

This is another of the species of *Rubus* in which flowering primocanes are not uncommon and represent a possible source of confusion.

REPRESENTATIVE SPECIMENS: MAINE: PENOBSCOT CO., Milford, *Fernald 13866* (NEBC); OXFORD CO., Bethel, *Pease 37595* (NEBC); LINCOLN CO., Monhegan Island, September 2, 1921, *Churchill* (NEBC); Boothbay Harbor, *Hodgdon 2719* (NHA); KENNEBEC CO., Clinton, July 17, 1915, *Bean* (NEBC); ANDROSCOGGIN CO., Auburn, August 17, 1916, *Bean* (NEBC); YORK CO., Kennebunkport (Parson Beach), July 8, 1905, *Blanchard* (NEBC); Kennebunkport, *Hodgdon & Steele 12485* (NHA). NEW HAMPSHIRE: COÖS CO., Dummer, *Harris 26588* (NEBC); Jefferson, *Pease 16899* (NEBC); Northumberland, *Fernald & Pease 15675* (NEBC); Colebrook, *Fernald & Pease 15794* (NEBC); CARROLL CO., Tuftonboro, *Hodgdon & Steele 12187* (NHA); Sandwich, *Steele 4001* (STEELE); GRAFTON CO., Haverhill, *Fernald 15769* (NEBC); Bath, *Fernald 15593* (NEBC); Thornton, *Hodgdon, Steele, & Lincoln 11265* (NHA, STEELE); Rumney, *Hodgdon & Steele 11297* (NHA, STEELE); STRAFFORD CO., New Durham, *Hodgdon & Steele 12259* (NHA); Durham, *Hodgdon & Steele 11298* (NHA); MERRIMACK CO., Hooksett, August 16, 1925, *Batchelder* (NEBC); Newbury, *Hodgdon 11377* (NHA); SULLIVAN CO., Plainfield, August 9, 1962, *Cowden, Eaton, Hodgdon, Poole & Wilson* (NHA); HILLSBORO CO., Peterboro, *Batchelder 693* (NEBC); CHESHIRE CO., Nelson, *Batchelder 2812* (NEBC). VERMONT: RUTLAND CO., Wallingford, September 1, 1912, *Kent* (NEBC); BENNINGTON CO., Searsburg, June 20, 1925, *Carpenter, Churchill & Knowlton,* (NEBC). MASSACHUSETTS: MIDDLESEX CO., Arlington, August 15, 1885, *Batchelder* (NEBC); Concord, July 13, 1935, *Eaton* (NEBC); BRISTOL CO., New Bedford, June 15, 1900, *Hervey* (NEBC); BARNSTABLE CO., Sandwich, *Fernald & Long 18575* (NEBC); Falmouth, August 9, 1927, *Fernald* (NEBC); WORCESTER CO., Harvard, August 6, 1916, *Forbes* (NEBC); FRANKLIN CO., Shelburne Falls, July 4, 1921, *Churchill* (NEBC); BERKSHIRE CO., New Marlboro, July 9, 1912, *Hoffmann* (NEBC). CONNECTICUT: WINDHAM CO., Plainfield, *Harger 6419* (NEBC); NEW LONDON CO., Groton, *Hodgdon & Steele 14852* (NHA); HARTFORD CO., New Canaan, *Steele 3934* (STEELE); LITCHFIELD CO., Colebrook, *Weatherby 2680* (NEBC); FAIRFIELD CO., Stratford, *Eames 2120* (NEBC).

REJECTED SPECIES

The following list of rejected New England species provides a suggested interpretation of each. No attempt is made to deal here with subspecific taxa. The generic name

Rubus is understood and the name of Bailey is also considered to be superfluous as the author of most of the names.

abactus = *pensilvanicus*
abbrevians Blanch. = *setosus* × *allegheniensis*
aculiferus Fern. = *setosus* × *allegheniensis*
adjacens Fern. = *hispidus* × *setosus*
alius = *arenicola*
alter = *hispidus* × *setosus*
alumnus = *allegheniensis* × *pensilvanicus*
amicalis Blanch. = *elegantulus*
amnicola Blanch. = *pensilvanicus*
Andrewsianus Blanch. = *pensilvanicus*
apparatus = *vermontanus*
aptatus = *recurvicaulis*
arcuans Fern. & St. John = *recurvicaulis* × *setosus*
arundelanus Blanch. = *recurvicaulis*
ascendens Blanch. = *semisetosus*
auroralis = *allegheniensis*
avipes = *pensilvanicus*
Baileyanus Britt. (type inadequate) = *Enslenii*
barbarus = *pensilvanicus*
bellobatus = *frondosus*
Bicknellii = *setosus* × *recurvicaulis*
biformispinus Blanch. = *hispidus* × *allegheniensis*
Bigelovianus = *semisetosus*
Blakei = *argutus*
Blanchardianus = *hispidus* × *setosus*
Boottianus = *setosus*
Brainerdii Rydb. = *arenicola*
brevipedalis = *recurvicaulis*
coloniatus = *recurvicaulis*
conanicutensis = *pensilvanicus*
cubitans Blanch. = *hispidus*
curtipes = *arenicola*
Deaneanus = *vermontanus*
eflagellaris = hybrid involving one of the Flagellares
electus = *hispidus* × *allegheniensis*
facetus = *pensilvanicus*
felix = *flagellaris*
Fernaldianus = *allegheniensis*
frondisentis Blanch. = *setosus*
geophilus = *flagellaris*
glandicaulis Blanch. = *setosus* × *allegheniensis*
gnarus = identity unknown
Gravesii (Fern.) Bailey = *allegheniensis*
Groutianus Blanch. = *setosus* × *vermontanus*
harmonicus = *hispidus* × *setosus*
heterogeneous = *frondosus*
heterophyllus Willd. = identity unknown
hispidoides = *semisetosus*
honorus = *pensilvanicus*
insons = *pensilvanicus*
insulanus = *frondosus*
invisus (Bailey) Britt. = not in New England according to Bailey
jacens Blanch. = *hispidus* × *setosus*
jactus = *hispidus* × *allegheniensis*
Janssonii = *arenicola*
Jeckylanus Blanch. = *recurvicaulis*
jugosus = *argutus*
junceus = *vermontanus*
junior = *setosus*
Kennedyanus Fern. = *elegantulus*
laevior (Bailey) Fern. = *his-*

pidus × *allegheniensis*
latens = hybrid involving *allegheniensis*
Lawrencei = *setosus*
licitus = *allegheniensis* × *pensilvanicus*
longissimus = *allegheniensis*
mainensis = *hispidus* × *flagellaris*
maniseesinsis = *flagellaris*
Millspaughii Britt. = *canadensis*
miscix = *vermontanus* × *pensilvanicus*
montpelierensis Blanch. = *setosus* × *allegheniensis*
multiformis Blanch. = *elegantulus*
multilicius = *vermontanus* × *elegantulus*
multispinus Blanch. = *frondosus*
nigricans Rydb. = *setosus*
nigrobaccus = *allegheniensis*
notatus = *setosus*
novanglicus = identity unknown
obsessus = *arenicola*
orarius Blanch. = *pensilvanicus*
ortivus = *semisetosus*
ostryifolius Rydb. = *pensilvanicus*
paludivigus Fern. = *argutus*
Parlinii = *setosus* × *vermontanus*
paulus = *allegheniensis* × *pensilvanicus*
pauper = *arenicola*
peculiaris = *vermontanus* × *pensilvanicus*
pergratus Blanch. = *pensilvanicus*
perinvisus = *semisetosus*
permixtus Blanch. = *hispidus* × *allegheniensis*
perpauper = *arenicola*
pervarius = *hispidus*
philadelphicus Blanch. = *pensilvanicus*
plicatifolius Blanch. = *recurvicaulis*
positivus = *recurvicaulis*
procumbens Muhl. = *flagellaris*
prosper Bailey = *arenicola*
pudens = *hispidus* × *setosus*
pugnax = *allegheniensis*
Randii Rydb. = *canadensis* (depauperate)
ravus = *vermontanus* × *allegheniensis*
recurvans Blanch. = *frondosus*
rhodinsulanus = *recurvicaulis*
rixosus = *hispidus* × *setosus*
roribaccus (Bailey) Rydb. = doubtfully present in New England, an escape from cultivation in the North
Rosa = *allegheniensis* × *pensilvanicus*
Rossbergianus Blanch. = *frondosus*
saltuensis = *allegheniensis*
Sanfordii = *hispidus* × *allegheniensis*
sativus Brain. = *allegheniensis*
scambens = *Jaysmithii* (specimen called R. *scambens* from New England is *flagellaris*
sceleratus Brain. = *setosus* × *allegheniensis*
semierectus Blanch. = *recurvicaulis*
sempervirens Bigel. = *Enslenii*
severus Brain. = *recurvicaulis* × *vermontanus*
significans = *setosus*
singulus = *vermontanus*
spiculosis Fern. = *hispidus*
tardatus Blanch. = extreme of *vermontanus*
tetricus = *Jaysmithii*
tholiformis Fern. = *hispidus* × *setosus*

trifrons Blanch. = *hispidus* × *setosus*
udus = *setosus*
usus = *recurvicaulis*
univocus = *setosus* × *vermontanus*
vigoratus = *hispidus* × *setosus*
viridifrons = *hispidus* × *vermontanus*

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